

UNIVERSITY OF WISCONSIN
College of Agriculture
Agricultural Engineering Department

RURAL ELECTRIFICATION - INFORMATION SHEET

The Department will send out new and pertinent information and illustrations from time to time in the form of loose leaves punched as per this specimen to fit a loose leaf note book.

Use tabbed index. It is suggested that the book be fitted with a tabbed index, using the index labels given on the index sheet accompanying this sheet.

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Department of Agricultural Engineering

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U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF PLANT INDUSTRY
WASHINGTON, D. C.

PLANT INDUSTRY

The Department will send out new and revised information and figures
regarding the status of the plant industry in the United States and
abroad to all those who are interested in the subject.

Has added today. It is important that the new be placed with a
correct index, under the proper heading of the plant industry.

U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF PLANT INDUSTRY

WASHINGTON, D. C.
PLANT INDUSTRY
BUREAU OF PLANT INDUSTRY

File under Cooking
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UNIVERSITY OF WISCONSIN
College of Agriculture
Agricultural Engineering Department

A survey on the characteristics and uses of electric ranges was held in the territories of the Southern Wisconsin Electric Highway and the Wisconsin Public Service Corporation by the Agricultural Engineering Department, College of Agriculture. Thirty-four answered the question sent out and the replies are tabulated below.

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1901-1, '21-1, '22-1, '24-1, '25-1
'26-9, '27-17.

From 4 to 6.

13 none, 10 none, 1 421.

22 do, 8 do not, 0 none.

22 do, 11 do not, 1 none.

5.

23 none, 2-1, 1-1, 9-1

20-3 heaters, 12-45, 1-55, 1-45.

26 open, 4 closed, 2 closed and used.

23 do, 4 below, 1 none.

27 none, 2 below, 1000 have to pay
for them.

27 none, 27 have not.

27 have not.

27 have, 1 have not.

27 do, 2 do not.

27 have, 3 have not.

Electric gas is over than ventilation.
This tank and shell desirable. Better
are as follows. Closed tank and
better design. Tankwater is over.
Conventional outlet. Larger steel.

5.

UNITED STATES OF AMERICA
BUREAU OF AGRICULTURE
BUREAU OF ENTOMOLOGY
BUREAU OF PLANT INDUSTRY
BUREAU OF SOILS
BUREAU OF VEGETATION
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UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT

RANGE SURVEY - 1928

A survey on the characteristics and uses of electric ranges was made in the territories of the Southern Wisconsin Electric Company and the Wisconsin Public Service Corporation by the Agricultural Engineering Department, College of Agriculture. Thirty-four answered the questionnaires sent out and the replies are tabulated below.

<u>Questions Asked</u>	<u>Answers</u>
1. Number and year ranges were purchased.	1901-1, '21-1, '22-1, '24-1, '25-4, '26-9, '27-17,
2. Average number cooked for.	From 4 to 6.
3. Number purchasing bakery goods.	16 some, 16 none, 1 all.
4. Number using range for heating dish water.	23 do, 6 do not, 5 some.
5. Number using range for canning.	22 do, 11 do not, 1 some.
6. Number having combination range.	5.
7. Number using pressure, fireless or waterless cookers.	26 none, 2-p, 1-f, 7-w
8. Number of ranges with 3,4,5 or 6 burners.	20-3 burners, 12-4b, 1-5b, 1-6b.
9. Number having open or closed burners.	26 open, 4 closed, 2 closed and open.
10. Number having oven on side, below or above.	29 side, 4 below, 1 above.
11. Preference of location of oven,	27 side, 2 below. Rest have no preference.
12. Number having oven with automatic temperature control.	23 have, 11 have not.
13. Reliability of automatic temperature control.	All say good.
14. Number with automatic clock control.	25 have, 8 have not.
15. Number believing clock worth extra cost.	9 do, 9 do not.
16. Number having convenience outlet.	31 have, 3 have not.
17. Changes and improvements suggested are:	Eliminate gas in oven thru ventilation. High back and shelf desirable. Better wire connections. Closed plate and better burners. Thermometer on oven. Convenience outlet. Larger oven.
18. Average number of months used in year	8.

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UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT

ELECTRO-TEST FARM RECORDS

These records were taken during 1928 on the farm of Mr. Geo. Walters, Electro-Test Farm #20, Allenville, Wis. Mr. Walters is served by the Wisconsin Public Service Corporation.

Table giving the monthly bill and kilowatt hour consumption as well as the consumption of various pieces of equipment. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights, iron washer, soft water pump	Hard Water Pump	House Refrigerator	Range	Water Heater	5 HP Motor	Milking Machine	Light Poultry House
Jan. 23	176	\$8.63	4.90¢	50	22		59			45	
Feb. 21	168	8.40	5.00	37	26		54			46	5
Mar. 26	208	9.54	4.59	35	30		84			53	6
Apr. 23	207	9.51	4.59	25	26		114			42	
May 23	304	12.27	4.04	21	28	31	182			42	
June 25	361	13.90	3.85	24	19	32	241			45	
July 25	354	13.70	3.87	20	19	45	233			37	
Aug. 28	524	18.54	3.54	27	21	58	239	134*		45	
Sept. 22	356	13.76	3.86	35	13	33	167	61	25	22	
Oct. 23	407	15.21	3.74	43	22	38	173		83	48	
Nov. 21	290	11.89	4.10	49	19	29	147		7	39	
Dec. 21	310	12.44	4.01	52	25	24	123		34	40	12
Total	3665	\$147.78		418	270	290	1816	195	149	504	23
Ave. per mo.	305.5	\$12.31	4.03¢	35	22.5	36	151	97	37	42	8

NOTE: The first month started December 23, 1927.

* The 134 kw. hr. consumption for the water heater covers a period of 38 days.

GENERAL INDEX

File under Electro-Test Farms
3-29

ELECTRO-TEST FARM RECORDS

Table giving the monthly kilowatt hour consumption and bill as well as the cost of operating various pieces of equipment on Electro-Test Farm No. 20. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights, iron washer, water pump	Hard Water Pump	House Refrigerator	Range	Water Heater	5 HP Motor	Milking Machine	Light Poultry House
Jan. 23	176	\$8.63	4.90¢	\$2.45	\$1.08		\$2.89			\$2.21	
Feb. 21	168	8.40	5.00	1.85	1.30		2.70			2.30	.25
Mar. 26	208	9.54	4.59	1.61	1.38		3.85			2.43	.27
Apr. 23	207	9.51	4.59	1.15	1.19		5.34			1.93	
May 23	304	12.27	4.04	.84	1.13	\$1.25	8.35			1.70	
June 25	361	13.90	3.85	.93	.75	1.23	9.18			1.73	
July 25	354	13.70	3.87	.77	.74	1.74	9.02			1.43	
Aug. 28	524	18.54	3.54	.96	.74	2.05	8.46	\$4.74		1.59	
Sept. 22	356	13.76	3.86	1.55	.50	1.28	6.45	2.36	\$\$.97	.85	
Oct. 23	407	15.21	3.74	1.60	.82	1.42	6.47		3.10	1.80	
Nov. 21	290	11.89	4.10	2.01	.78	1.19	6.02		.29	1.60	
Dec. 21	310	12.44	4.01	2.08	1.00	.97	4.93		1.37	1.60	.48
Total	3665	\$147.78		\$17.60	\$11.39	\$11.13	\$73.66	\$7.10	\$5.73	\$21.17	\$1.00
Ave. per mo.	305.5	\$12.31	4.03	\$1.47	\$.85	\$1.39	\$6.14	\$3.55	\$1.43	\$1.76	\$.33

The lights in the house and barn, the washer, iron, soft water pump, vacuum cleaner and waffle iron, are all on one meter.

The hard water pump supplies water for both house and barn.

The house refrigerator has a capacity of 7 cu. ft.

The range is operated for a family of four constantly and it has a kitchen heater attached for wood or coal, which heats the kitchen. Many additional meals are served to guests and extra help.

The water heater is used when the furnace is not in operation.

The 5 HP motor was used to fill the silo in October, the other months it is used to cut cornstalks and grind feed.

The milking machine takes care of an average of 17.2 cows which produce an average of 9734 lbs. of milk per month.

During February and March, 75 head of poultry were lighted for 189 hours. During December 75 hens were lighted for a total of 150 hours.

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HARD WATER PUMP RECORDS ON ELECTRO-TEST FARM NO. 20

<u>Date</u>	<u>Kw. Hrs.</u>	<u>Cost</u>	<u>Cu. Ft. Water Pumped</u>
Jan. 23	22	\$1.08	5601
Feb. 21	26	1.30	7220
Mar. 26	30	1.38	8150
Apr. 23	26	1.19	8570
May 23	28	1.13	9290
June 25	19	.73	5540
July 25	19	.74	Meter
Aug. 28	21	.74	out
Sept. 22	13	.50	of
Oct. 23	22	.82	order
Nov. 21	19	.78	
Dec. 21	25	1.00	
Total	270	\$11.39	44,371 (6 mo.)
Ave. per mo.	22.5	.85	7395

The hard water pump furnishes water for drinking, cooking and toilet flushing tank besides 4 horses, 25 head of cattle and 20 hogs.

MILKING MACHINE RECORDS ON ELECTRO-TEST FARM NO. 20

<u>Date</u>	<u>Kw. Hrs.</u>	<u>Ave. Cost per Kw. Hr.</u>	<u>Cost</u>	<u>Cows Milked</u>	<u>#Milk</u>
1927					
Dec. 23					
1928					
Jan. 23	45	4.90¢	\$2.21	18	9,755
Feb. 21	46	5.00	2.30	18	9,482
Mar. 26	53	4.59	2.43	20	11,550
Apr. 23	42	4.59	1.93	15	10,500
May 23	42	4.04	1.70	16	10,200
June 25	45	3.85	1.73	17	11,050
July 25	37	3.87	1.43	17	10,890
Aug. 28	45	3.54	1.59	18	10,280
Sept. 22	22	3.86	.85	16	8,174
Oct. 23	48	3.74	1.80	18	10,122
Nov. 21	39	4.10	1.60	16	7,180
Dec. 21	40	4.01	1.60	17	7,630
Totals	504	4.03¢	\$21.17	206	116,813
Ave. per mo.	42	4.20¢	1.76	17.2	9,734#

The average cost for milking 1000 pounds of milk is 18.1 cents.

HARD WATER PUMP RECORDS ON WILKINS-TEST FARM NO. 20

Date	Rw. Hrs.	Cost	Cu. Ft. Water Pumped
Jan. 23	22	\$1.08	2501
Feb. 21	26	1.30	2220
Mar. 28	30	1.38	2150
Apr. 22	26	1.19	2270
May 23	28	1.13	2280
June 25	19	1.73	2340
July 25	19	1.74	2270
Aug. 28	21	1.74	2270
Sept. 28	13	1.50	2270
Oct. 28	22	1.82	2270
Nov. 21	19	1.78	2270
Dec. 21	22	1.00	2270
Total	270	\$11.39	24,371 (6 mc.)

Average per month \$2.50
The hard water pump furnishes water for drinking, cooking and toilet flushing tank besides 4 horses, 25 head of cattle and 20 head of sheep.

MILKING MACHINE RECORDS ON WILKINS-TEST FARM NO. 20

Date	Rw. Hrs.	Ave. Cost per Hr.	Cost - Cows	Milk
Dec. 23	40	4.01	1.60	10,120
Jan. 23	46	4.90	2.21	8,725
Feb. 21	46	6.00	2.30	8,425
Mar. 28	53	4.29	2.24	11,850
Apr. 22	42	4.52	1.92	10,500
May 23	42	4.04	1.70	10,200
June 25	45	3.85	1.73	11,050
July 25	37	3.37	1.43	10,800
Aug. 28	40	3.24	1.32	10,280
Sept. 28	23	3.23	.85	8,174
Oct. 28	48	3.74	1.80	10,122
Nov. 21	30	4.10	1.30	7,180
Dec. 21	40	4.01	1.60	10,120
Total	504	4.03	21.17	116,913
Ave. per mo.	42	4.20	1.76	9,734

The average cost for milking 1000 pounds of milk is 18.1 cents.

UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT.

ELECTRO-TEST FARM RECORDS

These records were taken during 1928 on the farm of Mr. J. W. Stone, Electro-Test Farm No. 2, Whitewater, Wis. in cooperation with the Wisconsin Gas and Electric Company.

Table giving the monthly bill and kilowatt hour consumption as well as the consumption of various pieces of equipment. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost Per Kw. Hr.	Lights and Misc.	Hard Water Pump	Range	Hammer Mill	Milking Machine
Jan. 15	361	\$14.09	3.90¢	78	16	189	26	52
Feb. 14	336	13.26	3.95	61	24	154	28	69
Mar. 13	324	12.87	3.97	41	17	153	43	70
Apr. 13	363	14.16	3.90	57	19	189	40	78
May 15	426	16.26	3.82	55	17	265	51	78
June 14	337	13.30	3.95	33	17	216	8	63
July 13	279	11.37	4.08	34	17	165	6	57
Aug. 14	283	11.50	4.06	25	29	185	—	44
Sept. 14	328	13.00	3.97	31	25	214	6	52
Oct. 12	232	9.81	4.23	29	24	127	19	33
Nov. 13	304	12.20	4.01	50	15	154	36	49
Dec. 13	459	17.30	3.77	106	21	227	42	63
TOTALS	4032	159.12		560	241	2238	285	708
Ave. per mo.	336	13.26	3.95	47	20	187	24	59

NOTE: The first month started December 15, 1927.

ELECTRO-TEST FARM RECORDS

Table giving the monthly kilowatt hour consumption and bill as well as the cost of operating various pieces of equipment on Electro-Test Farm No. 2. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost Per Kw. Hr.	Lights and Misc.	Hard Water Pump	Range	Hammer: Feed : Mill : Machine:
Jan. 15	361	\$14.09	3.90¢	3.04¢	\$1.63	\$7.37	\$1.02: \$2.05:
Feb. 14	336	13.26	3.95	2.41	.95	6.08	1.10: 2.72:
Mar. 13	324	12.87	3.97	1.65	.68	6.07	1.71: 2.78:
Apr. 13	363	14.16	3.90	1.45	.74	7.37	1.56: 3.04:
May 15	428	16.26	3.82	1.33	.65	10.12	1.18: 2.98:
June 14	337	13.50	3.95	1.30	.67	8.53	.31: 2.49:
July 13	279	11.37	4.08	1.39	.69	6.73	.24: 2.32:
Aug. 14	283	11.50	4.06	1.02	1.18	7.51	--: 1.79:
Sept. 14	328	13.00	3.97	1.23	.99	8.49	.23: 2.06:
Oct. 12	232	9.81	4.23	1.23	1.01	5.37	.80: 1.40:
Nov. 13	304	12.20	4.01	2.01	.60	6.18	1.44: 1.97:
Dec. 13	459	17.30	3.77	4.00	.79	8.56	1.58: 2.37:
TOTAL	4032	\$159.12		\$22.04	\$9.58	\$88.38	\$11.17: \$27.95:
AVE. PER MO.	336	13.26	3.95¢	1.84	.80	7.36	.93: 2.55:

Miscellaneous under Lights includes washing machine, iron, soft water pump, vacuum sweeper, battery charger for radio, curling iron and poultry house lighting.

The hard water pump furnished water for drinking, cooking and toilet flushing tanks besides 45 head of cattle, 7 horses and 600 chickens. This is a hydro-pneumatic system operated with a 1/2 H.P. motor. The total water lift is 25 feet. The capacity of the pump is 550 gallons per hour. The capacity of the tank is 350 gallons.

The range is used to cook for an average of 4 people. Water is also heated on it daily to wash and sterilize all dairy equipment. The total watts of the range is 10,350.

The hammer type feed mill is operated with a 5 HP motor. It grinds all the grain used in the dairy ration. (See next sheet).

The milking machine is used on an average of 18.3 cows producing an average of 14,350 pounds per month. (See next sheet).

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Feed Grinding Records on Electro-Test Farm No. 2

Date of	Kw.	Ave. Cost:		Pounds & Kind of Grain Ground			
Reading	Hrs.	Per Kw.Hr.	Cost:	Barley	Oats	Corn	
Jan. 15	26	3.90¢	\$1.02	2400	1750		
Feb. 14	28	3.95	1.10	1240	855	895	
Mar. 13	43	3.97	1.71	1940	2320	100	
Apr. 13	40	3.90	1.56	2825	3210	520	
May 15	31	3.82	1.18	625	1775	1170	
June 14	8	3.95	.31		735	1335	
July 13	6	4.08	.24			3000	
Aug. 14	Not in use						
Sept. 14	6	3.97	.23	344	380		
Oct. 12	19	4.23	.80	1050	1100		
Nov. 13	36	4.01	1.44	2235	1245		
Dec. 13	42	3.77	1.58	2870	1740		
TOTALS	285		\$11.17	15,529	15,110	7020	
AVE. PER MO.	24		\$.93	1,294	1,259	585	

The cost of grinding feed is 59¢ per ton. The average amount of the various grains ground per month is 3138 pounds.

A hammer type feed mill is used and operated with a 5 HP motor.

Milking Machine Records on Electro-Test Farm No. 2

Date of	Kw.	Ave. Cost		No. cows	Pounds
Reading	Hrs.	Per Kw. Hr.	Cost	Milked	Milk
Jan. 15	52	3.90¢	\$2.03	18	16,500
Feb. 14	69	3.95	2.72	24	18,350
Mar. 13	70	3.97	2.78	23	18,500
Apr. 13	78	3.90	3.04	23	20,500
May 15	78	3.82	2.98	23	17,540
June 14	63	3.95	2.49	22	15,000
July 13	57	4.08	2.32	17	13,600
Aug. 14	44	4.06	1.79	15	10,000
Sept. 14	52	3.97	2.06	13	9,000
Oct. 12	33	4.23	1.40	10	8,000
Nov. 13	49	4.01	1.97	14	10,000
Dec. 13	63	3.77	2.37	18	15,200
TOTALS	708		\$27.95	220	172,190
AVE. PER MO.	59		\$ 2.33	18.3	14,350

The average cost to milk 1000 pounds of milk is 16.2 cents. It costs an average of 12.7 cents to milk one cow one month. A pipe line machine, eleven years old, is used on this farm. A 3/4 H.P. motor operates two double units.

Feed Grinding Records on Electric-Test Farm No. 2

Date of	Lb. : Ave. Cost :	No. cows :	Feed :
Reading : Mrs. P. H. H. : 0.15 :			
Jan. 15 : 55 : 2.90 :	1750 :		
Feb. 15 : 58 : 2.95 :	835 :		
Mar. 15 : 58 : 2.97 :	1750 :		
Apr. 15 : 40 : 2.90 :	2310 :		
May 15 : 51 : 2.85 :	1750 :		
June 15 : 8 : 2.95 :	1750 :		
July 15 : 8 : 2.95 :	2000 :		
Aug. 15 : Not in use :			
Sept. 15 : 6 : 2.95 :	2000 :		
Oct. 15 : 12 : 2.95 :	1750 :		
Nov. 15 : 25 : 2.95 :	1750 :		
Dec. 15 : 12 : 2.95 :	1750 :		
TOTALS : 285 :	15,110 :		
Ave. per cow : 52 :	1.25 :		

The cost of grinding feed is 52¢ per ton. The average amount of the various grain ground per month is 3158 pounds. A hammer type feed mill is used and operated with a 5 HP motor.

Milking Machine Records on Electric-Test Farm No. 2

Date of	Lb. : Ave. Cost :	No. cows :	Milk :
Reading : Mrs. P. H. H. : 0.15 :			
Jan. 15 : 55 : 2.90 :	18,800 :		
Feb. 15 : 58 : 2.95 :	18,800 :		
Mar. 15 : 58 : 2.97 :	18,800 :		
Apr. 15 : 40 : 2.90 :	20,800 :		
May 15 : 51 : 2.85 :	17,800 :		
June 15 : 8 : 2.95 :	18,000 :		
July 15 : 8 : 2.95 :	18,800 :		
Aug. 15 : Not in use :			
Sept. 15 : 6 : 2.95 :	18,000 :		
Oct. 15 : 12 : 2.95 :	18,000 :		
Nov. 15 : 25 : 2.95 :	18,000 :		
Dec. 15 : 12 : 2.95 :	18,200 :		
TOTALS : 285 :	18,100 :		
Ave. per cow : 52 :	1.25 :		

The average cost for milk 1000 pounds of milk is 12.5 cents. It costs an average of 12.7 cents for milk one month. A pipe line machine, eleven years old, is used on this farm. 2 3/4 HP motor operates two double units.

UNIVERSITY OF WISCONSIN
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ELECTRO-TEST FARM RECORDS

These records were taken during 1928 on the farm of W. G. Marshall, Electro-Test Farm No. 3, Whitewater, Wis. in cooperation with the Wisconsin Gas and Electric Company.

Table giving the monthly bill and kilowatt hour consumption as well as the consumption of various pieces of equipment. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw.Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights and Misc.	Range	Soft Water Pump	Hard Water Pump	Vacuum Sweeper	Milking Machine and Pump
Jan. 23	327	\$13.18	4.03¢	103	160	1	3	2	58
Feb. 23	289	11.92	4.13	81	144	1	2	2	59
Mar. 23	251	10.65	4.24	61	125	1	3	1	60
Apr. 24	265	11.12	4.20	42	147	1	2	1	72
May 23	249	10.59	4.25	22	153	2	3	2	67
June 23	241	10.32	4.28	13	191	1	2	2	35
July 23	225	9.57	4.25	3	182	2	4	2	32
Aug. 23	238	10.01	4.21	3	193	1	4	1	33
Sept. 24	285	11.57	4.06	21	230	1	3	2	28
Oct. 23	317	12.65	3.98	38	242	1	5	1	30
Nov. 23	289	11.70	4.05	76	172	2	4	2	33
Dec. 23	312	12.47	4.00	87	171	1	3	2	48
TOTALS	5288	\$135.73		552	2110	15	38	20	553
AVE. PER MO.	274	11.31	4.13¢	46	176	1.3	3	1.7	46

NOTE: The first month started December 23, 1927.

ELECTRO-TEST FARM RECORDS

Table giving the monthly kilowatt hour consumption and bill as well as the cost of operating various pieces of equipment on Electro-Test Farm No. 3. It also includes the totals for the year and monthly averages.

Date of Reading	Total : Kw. Hrs.	Total : Bill	Average : Cost per Kw.Hr.	Lights : and Misc.	Range :	Soft : Water Pump	Hard : Water Pump	Vacuum : Sweeper:& Pump	Milking : Machine
Jan. 23	327	\$13.18	4.03¢	\$4.15	\$6.45	\$0.04	\$0.12	\$0.08	\$2.34
Feb. 23	289	11.92	4.13	3.34	5.95	.04	.08	.08	2.43
Mar. 23	251	10.65	4.24	2.59	5.30	.04	.13	.04	2.55
Apr. 24	265	11.12	4.20	1.77	6.17	.04	.08	.04	3.02
May 23	249	10.59	4.25	.94	6.51	.08	.13	.08	2.85
June 23	241	10.32	4.28	.51	8.18	.04	.09	.09	1.41
July 23	225	9.57	4.25	.12	7.74	.09	.17	.09	1.36
Aug. 23	238	10.01	4.21	.25	8.12	.04	.17	.04	1.39
Sept. 24	285	11.57	4.06	.85	9.34	.04	.12	.08	1.14
Oct. 23	317	12.63	3.98	1.52	9.63	.04	.20	.04	1.20
Nov. 23	289	11.70	4.05	3.08	6.96	.08	.16	.08	1.34
Dec. 23	312	12.47	4.00	3.48	6.83	.04	.12	.08	1.92
TOTALS	3288	\$135.73		\$22.60	\$87.18	\$0.61	\$1.57	\$0.82	\$22.95
AVE. PER MO.	274	\$11.31	4.13¢	\$1.88	\$7.27	\$0.05	\$0.13	\$0.07	\$1.91

Miscellaneous under Lights includes washing machine, iron, electric radio, toaster, curling iron, waffle iron, soldering iron and poultry house lighting.

The range is used to cook for an average of 2.5 people. Water is also heated on it to wash and sterilize all dairy equipment. This is a 6000 watt range.

The soft and hard water systems are used for pumping cistern and well water respectively, for the house only.

The milking machine and water system for pumping water for the stock are operated by one motor and metered together. (See next sheet)

Milking Machine and Gravity Water Supply System
Records on Electro-Test Farm No. 3.

Date	Kw.Hrs.	Ave. Cost per Kw. Hr.	Cost of Milking	Cost of Pumping Water	No. cows milked	Pounds milked
Jan. 23:	58	4.03¢	\$1.17	\$1.17	22	19,000
Feb. 23:	59	4.13	1.21	1.22	22	18,000
Mar. 23:	60	4.24	1.28	1.27	25	21,000
Apr. 24:	72	4.20	1.51	1.51	25	19,000
May 23:	67	4.25	1.42	1.43	24	24,000
June 23:	33	4.28	1.41	Not used	24	21,000
July 23:	32	4.25	1.36	" "	20	15,000
Aug. 23:	33	4.21	Not used	1.39	Not used	
Sept. 24:	28	4.06	"	1.14	"	"
Oct. 23:	30	3.98	"	1.20	"	"
Nov. 23:	33	4.05	"	1.34	"	"
Dec. 23:	48	4.00	"	1.92	"	"
TOTALS	553		\$9.36	\$13.59	162	137,000
AVE. PER MO:	46		\$1.34	\$1.36	23.1	19,571

These two pieces of equipment are requiring approximately the same amount of energy so the monthly bills are divided equally between them for the first five months.

A 2 HP motor is used to pump the water into a gravity tank and operate the milking machine. No water was pumped during the months of June and July as the stock had enough water in the pasture. Water is pumped for an average of 45 head of cattle, 5 horses and 300 head of poultry at an average cost of \$1.36 per month.

The use of the pipe line milking machine was discontinued on August 1. He averaged 23.1 cows per month at an average cost of \$1.34 per month, or 5.8 cents per cow per month. The average cost of milking 1000 pounds of milk is 6.8 cents.

Primary Line: Not smaller than #6 wire. If the distance is a considerable distance from the transformer proportionately heavier wire should be used.

Feed Transmission

Belts: 4" to 6" wide. Standard pulley is 3 1/2" dia. A 6" belt will have to be in fair wear condition or kept very tight to transmit the full overhead capacity as developed for short periods.

Avoid stiff belts on account of the small water pulley. Use not over 4 ply belting canvas or rubber, and single or leather belts. A distance of 10 to 20 feet between pulleys is best. Sometimes longer or shorter belts can be used.

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CUTTING ENSILAGE WITH 5 H. P. MOTOR

Recommended Specifications

Cutter

Type: Flywheel. Two or three knife.

Size: 12" to 15" throat width. 12" or 13" preferred. No feeder is used at the machine, therefore smaller sizes are not practical.

Fan design for good elevation: The fan wings must fit the housing very closely (Clearance not over 1/8") especially at the tips or ends. A reasonably close fit at the sides is also important.

Power

Motor: 5 H. P. Single phase. 1800 or 1200 R. P. M. 7 1/2 H. P. where rates will permit.

Switch: Magnetic type with thermal overload relay. Never use fused line switch.

Transformer: 5 K. V. A. for a 5 H. P. motor.

Primary Line: Good voltage regulation.

Secondary Line: Not smaller than #6 wires. If the motor is a considerable distance from the transformer proportionately heavier wires should be used.

Power Transmission

Belt: 4" to 6" wide. Standard motor pulley is 6 1/2" wide. A 4" belt will have to be in first class condition or kept very tight to transmit the full overload capacity as developed for short periods.

Avoid stiff belts on account of the small motor pulley. Use not over 4 ply stitched canvas or rubber, and single ply leather belts. A distance of 15 to 25 feet between pulleys is best. Somewhat longer or shorter belts can be used.

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CUTTING ENGINE WITH S. H. P. MOTOR

Recommended Specifications

Cutter

Type: Plowshare. Two or three knives.
Size: 12" to 15" throat width. 12" or 15" preferred. No feeder is used at the machine, therefore smaller sizes are not practical.
Can be used for good effect. The two wings must fit the housing very closely. Clearance not over 1/8" especially at the tips or ends. A reasonably close fit at the sides is also important.

Power

Motor: S. H. P. Single phase, 1800 or 1900 R. P. M. 1/2 S. H. P. where rates will permit.

Switch: Magnetic type with thermal overload relay. Never use fused line switch.

Transformer: 5 K. V. A. for a S. H. P. motor.

Primary Line: Good voltage regulation.

Secondary Line: Not smaller than 4 wires. All the motor is a considerable distance from the transformer proportionately heavier wires should be used.

Power Transmission

Belt: 4" to 6" wide. Standard motor pulley is 8 1/2" wide. A 4" belt will have to be in first class condition or kept very tight to transmit the full overload capacity as developed for short periods.
Avoid split belts on account of the small motor pulley. Use fast over & pig attached canvas or rubber, and split the heavier belt. A distance of 10 to 15 feet between pulleys is best. Sometimes longer or shorter belts can be used.

If the belt is not too short a crossed belt will have less tendency to flap and slip over the small motor pulley. A crossed belt is not satisfactory with an extremely small pulley.

Pulleys: Motor pulley. Fibre. 6-1/2 " face. Not smaller than 4-1/2" diameter.

Cutter pulley. Cutter pulleys vary from 18" to 24" in diameter for this work. Refer to table for proper cutter speed then calculate the exact diameter of cutter pulley as follows:

$$\text{Cutter pulley diameter} = \frac{\text{Motor pulley diameter} \times \text{Motor R.P.M.}}{\text{Cutter R.P.M.}}$$

Operation, Care, and Adjustment.

Speed of the cutter: Practically the whole secret of cutting ensilage with a 5 H.P. electric motor depends upon operating the cutter at a very slow speed. (Refer to table of proper cutter speeds.) Many of the older models of cutters will not elevate successfully at these slow speeds and a 5 H.P. will not pull the cutter at high speeds.

Rate of cutting: Four to ten tons per hour can be cut depending upon the following factors:

1. Speed of cutter. (Extremely important)
2. Sharpness and setting of knives. (Important)
3. Length of cut. (Important)
4. Design of cutter. (Important)
5. Good electric line and transformer. (Important)
6. Proper belt and pulleys. (Important)
7. Careful feeding (Important)
8. Height of silo. (Not important)

Knives: Sharpen every half day being careful to maintain the original bevel. Adjust knives as close as possible to the shear bar so as not to strike when running.

Ledger plate or shear bar: Replace or turn over to a new edge when badly worn

Lubrication: Keep all working parts well lubricated.

Anchoring the cutter: A stake driven against the rear wheel next to the power is usually sufficient. An equally good anchor is to chain the cutter to a stake.

Anchoring the motor: The anchor should be fastened to the motor truck as near as possible directly behind the motor pulley. An iron or wooden anchor stake driven in the ground is satisfactory.

If the belt is not too short a crossed belt will have less tendency to flip and slip over the small motor pulley. A crossed belt is not satisfactory with an extremely small pulley.

Pulleys: Motor pulley. Fibre. 6-1/2" face. Not smaller than 4-5/8" diameter.

Cutter pulley. Cutter pulleys vary from 18" to 24" in diameter for this work. Refer to table for proper cutter speed then calculate the exact diameter of cutter pulley as follows:

$$\text{Cutter pulley diameter} = \frac{\text{Motor pulley diameter} \times \text{Motor R.P.M.}}{\text{Cutter R.P.M.}}$$

Operation, Care, and Adjustment.

Speed of the cutter: Practically the whole secret of cutting emulsion with a 5 H.P. electric motor depends upon operating the cutter at a very slow speed. (Refer to table of proper cutter speeds.) Many of the older models of cutters will not operate successfully at these slow speeds and a 5 H.P. will not pull the cutter at high speeds.

Rate of cutting: Four to ten tons per hour can be cut depending upon the following factors:

1. Speed of cutter. (Extremely important)
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3. Length of cut. (Important)
4. Design of cutter. (Important)
5. Good electric line and transformer. (Important)
6. Proper belt and pulleys. (Important)
7. Careful feeding. (Important)
8. Height of silo. (Not important)

Knives: Sharpen every half day being careful to maintain the original bevel. Adjust knives as close as possible to the shear bar so as not to strike when running.

Bedder plate or shear bar: Replace or turn over to a new edge when badly worn.

Lubrication: Keep all working parts well lubricated.

Anchoring the cutter: A stake driven against the rear wheel next to the power is usually sufficient. An equally good anchor is to chain the cutter to a stake.

Anchoring the motor: The anchor should be fastened to the motor track as near as possible directly behind the motor pulley. An iron or wooden anchor stake driven in the ground is satisfactory.

The following simple methods may be used for anchoring the motor and keeping the belt tight:

1. Self locking block and tackle with $3/8$ " or $1/2$ " rope is best
2. Small wire stretcher.
3. Pass a loop of light log chain or rope around the anchor stake and through the motor truck frame, then twist it.

Pipe: The pipe should be reasonably straight, and in fairly close alignment with the cutter. Where a telescoping section of pipe is used to adjust the height, it must be set up with the inner section at the lower end, otherwise it will interfere with proper elevation of the silage.

Silage distribution: This can be accomplished by hanging two sections of distributor to the elbow, and fastening them in such a position that the silage will fall directly in the middle of the silo and will roll down toward the sides.

Tramping is Unnecessary: If the silage is tramped it must be done thoroughly or it is apt to spoil. If it is desired to distribute the silage without tramping, this can be done by stationing a man at the top of the silo to handle a section or two of distributor.

Feeding: Ordinarily the bundles can be lapped $1/3$. Feed steadily. If the pitcher will take a little extra care in throwing the bundles on the feed table, a man will not be required at the cutter for feeding. This means quite a saving in labor.

Size of bundles: Average, medium sized bundles are satisfactory. It will not be necessary to split the bundles if they are not made too large.

Length of cut: Most silage is cut into $3/8$ " or $1/2$ " lengths. It is seldom cut longer than $1/2$ " and sometimes as short as $1/4$ ". Short cuts will reduce the tonnage per hour, and increase the current consumption per ton. Short cuts are a little harder to elevate.

Size of crew: The maximum size of crew which can be used to advantage depends upon the length of haul. The following crew is suggested:

1. One man on binder.
2. Two, three or four wagons unless the haul is extremely long.
3. One extra field pitcher, if desired.

The following simple methods may be used for mounting the motor and keeping the belt tight:

1. Roll loading block and axle with 3/8" or 1/2" rope in holes.
2. Small wire struts.

3. Pass a loop of light-log chain or rope around the anchor block and through the motor truck frame, then twist it.

Pipes: The pipe should be reasonably straight, and in fairly close alignment with the center. Where a telescoping section of pipe is used to adjust the height, it must be set up with the inner section at the lower end, so that it will interfere with proper elevation of the slides.

Slide Distribution: This can be accomplished by hanging two sections of slide distributor to the above, and fastening them in such a position that the slide will fall directly in the middle of the slide and will roll down toward the slides.

Tramping is Unnecessary: If the slide is tramped it must be done thoroughly or it is apt to split. It is better to distribute the slide without tramping. This can be done by attaching a man at the top of the slide to handle a section or two of distributor.

Feeding: Ordinarily the bundles are dropped 1/2 foot steadily. If the picker will take a little extra time in throwing the bundles on the feed table, a man will not be required at the center for feeding. This means quite a saving in labor.

Size of Bundles: Average medium sized bundles are satisfactory. It will not be necessary to split the bundles if they are not made too large.

Length of Gate: Most slides are cut into 3/8" or 1/2" lengths. It is seldom cut longer than 1/2" and sometimes as short as 1/4". Short cuts will reduce the tonnage per hour, and increase the current consumption per ton. Short cuts are a little harder to elevate.

Slide Crows: The maximum size of crew when used to advantage depends upon the length of track. The following crew is suggested:

1. One man on derrick.
2. Two, three or four wagon-men as the track is extremely long.
3. One extra slide picker, if desired.

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Agricultural Engineering Department

RESULTS OF CUTTING ENSILAGE WITH A 5 H. P. ELECTRIC MOTOR

Power - 5 HP - single phase - 1800 RPM motor.

Type of Cutters - Flywheel - 5 knife

Height of silos - 35 ft.

Cutter	Size Throat	Area Sq. Ins.	Length of Cut	Rev. per Min.	Tons Cut	Tons Per Hour	Kilo- watt Hours Used	Kilowatt Hours Per Ton	Condition Of Corn
A	13"	75	.458	445	55.57	6.14	42.3	0.762	Medium growth
A	13"	75	.392	445	20.24	6.02	18.2	0.900	Green ear just dent
B	15"	97	.486	400	4.78	6.33	5.3	1.108	Fairly large growth.
B	15"	97	.486	373	1.24	6.63	1.4	1.125	Badly frosted Leaves dry

Note 1. Tons per hour indicates the number of tons that would be cut in 1 hour of continuous operation with no time out.

Note 2. The difference in kilowatt hours per ton for the 15" and 13" machines is probably entirely due to the difference in the condition of corn. Those conclusions are drawn from data secured in past years.

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Agricultural Engineering Department

ENSILAGE CUTTER SPEEDS FOR 5 H. P. ELECTRIC MOTORS

Table of Cutter speeds for most efficient operation for different sized elevating fans and for silos of different heights.

Diameter of Cutter fan.	Height of Silo									
	25'	30'	35'	40'	45'	50'	55'	60'	75'	
	Revolutions per minute of Cutter fan									
36"	415	440	480	510	540	575	600	625	695	
38"	390	415	450	480	510	545	570	595	660	
40"	370	395	430	460	485	515	540	565	625	
42"	355	380	410	435	465	490	515	535	595	
44"	340	360	390	415	440	470	490	510	570	
46"	325	345	375	400	425	450	470	490	545	
48"	310	330	360	380	405	430	450	470	520	

Note: These speeds are based upon carefully conducted tests with a reasonable allowance to insure uninterrupted elevation. Good cutters will positively operate at these speeds.

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ENSLAGE CUTTER SPEEDS FOR 5 H. P. ELECTRIC MOTORS

Table of Cutter speeds for most efficient
operation for different sized elevating
fans and for sizes of different heights.

Diameter of Cutter Fan.	Height of Silo									
	25'	30'	35'	40'	45'	50'	55'	60'	65'	70'
Revolutions per minute of Cutter Fan										
	385	320	270	235	205	180	155	135	115	100
36"	415	440	480	510	540	575	600	625	635	
38"	390	415	450	480	510	545	570	595	600	
40"	370	395	430	460	495	515	540	565	585	
42"	355	380	410	435	465	490	515	535	555	
44"	340	365	390	415	440	470	490	510	530	
46"	325	350	375	400	425	450	470	490	510	
48"	310	335	360	385	410	435	455	475	495	

Note: These speeds are based upon carefully conducted tests with a
reasonable allowance to insure satisfactory operation. Good
cutters will positively operate at these speeds.

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GRINDING FEED AND ELEVATING GRAIN WITH ELECTRIC POWER

Mill Specifications

Type: Hammer type feed mill with fan elevator. The elevating fan is recommended as it simplifies removing the feed as ground at the mill, and the same fan may also be used for elevating grain into the bins at threshing time.

Size: Suitable for 2 to $7\frac{1}{2}$ horsepower motor. (Size ratings are not standardized.)

Bearings: Ball or roller.

Motor Specifications

Motor: 2, 3, 5 or $7\frac{1}{2}$ HP. Single phase. 1800 or 1200 R.P.M. (5 HP - 1800 R.P.M. Utility motor mounted on wheels is recommended.)

Switch: Magnetic type with thermal overload relay. Never use a fused starting switch.

Transformer Size:

2 HP motor	-	$1\frac{1}{2}$ K.V.A. transformer
3 HP "	-	3 K.V.A. "
5 HP "	-	3 or 5 K.V.A. "
$7\frac{1}{2}$ HP "	-	5 K.V.A. or larger transformer

Transformer Location: Hang the transformer as close to the center of the building group as possible, or close to the motor.

Primary Line: Good voltage regulation.

Secondary Line: The line from the transformer to the service switch, meter and on to the motor should be built according to the following specifications as to wire sizes.

Wire Sizes For 220 Volt, Single Phase, 60 Cycle
Repulsion-Induction Motors.

Size of Single Phase Motors	Distance from the transformer to the motor			
	Not over 100'	100' to 200'	200' to 300'	300' to 400'
2 HP	8	8	8	6
3 HP	8	8	8	6
5 HP	5	5	5	4
$7\frac{1}{2}$ HP	4	4	4	2

NOTE: Wire one size larger or smaller might be used, depending on the starting torque and R.P.M. of the motor. With motors of less than 700 R.P.M., the wire should be one size larger.

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GRINDING FEED AND ELEVATING GRAIN WITH HYDRAULIC POWER

Mill Specifications

Type: Hammer type feed mill with fan elevator. The elevating fan is recommended as it simplifies removing the feed as ground at the mill and the fan may also be used for elevating grain into the bins at threshing time.

Size: Suitable for 2 to 7 1/2 horsepower motor. (Size ratings are not standard.)

Bearings: Ball or roller.

Motor Specifications

Motor: 2, 3, 5 or 7 1/2 HP, Single phase, 1800 or 1200 R.P.M. (5 HP 1800 R.P.M. is recommended.)

Switch: Magnetic type with thermal overload relay. Never use a fused starting switch.

Transformer Size: 2 HP motor - 1 1/2 K.V.A. transformer
3 HP motor - 2 K.V.A. transformer
5 HP motor - 3 K.V.A. transformer
7 1/2 HP motor - 5 K.V.A. transformer

Transformer location: Place the transformer as close to the center of the building as possible or close to the motor.

Primary line: Good voltage regulation.

Secondary line: The line from the transformer to the service switch, motor and control should be built according to the following specifications as to wire sizes.

Wire sizes for 220 Volt, Single Phase, 60 Cycle

Size of Sinals: Distance from the transformer to the motor

2 HP	10	10	10	10
3 HP	10	10	10	10
5 HP	10	10	10	10
7 1/2 HP	10	10	10	10

NOTE: Wire one size larger on service line between building and the starting box and R.P.M. of the motor. With motors of less than 200 R.P.M. the wire should be one size larger.

-2-

Power Transmission

Drive: (a) Belted direct from the motor to the mill is usually recommended. Do not drive through a line shaft.

(b) Direct connected to a 3500 R.P.M. motor where the motor is used for grinding only.

Belt: Four inches wide, thin, flexible, and preferably endless for a 5 HP motor. 3 ply endless rubber, or light single ply leather, either endless or laced with wire lacing. Avoid thick, stiff belts and stiff cumbersome lacings. A distance of 8 to 15 feet between pulleys is good.

Pulleys: The grinders are usually equipped with fibre or cast iron pulleys 4" in diameter with a $4\frac{1}{2}$ " or 5" face. High speed is essential for efficient operation of a hammer mill.

Two types of rotating cylinders are used. In one type the cylinder is straight, the hammers are all the same length and the diameter is about one foot. The recommended speed is 4000 R.P.M. requiring a 9" pulley on an 1800 R.P.M. motor, or a 14" pulley on a 1200 R.P.M. motor.

In the other type, the cylinder is smaller on one end than the other and the grain is fed in at the small end. A speed of 3500 R.P.M. is recommended requiring an 8" pulley on an 1800 R.P.M. motor or a 12" pulley on a 1200 R.P.M. motor.

Installation

General Principles: The mill should be installed with an overhead bin so that it can be operated without an attendant. The ground feed can be dropped directly into an enclosed ground feed bin, or elevated to a convenient bin, or to the bagger by the fan elevator.

Hopper Bottoms for Bins: Hopper bottoms are not necessary for ordinary elevated grain bins, that are emptied only once or twice a year.

Small grain hoppers over the mill should have sloping bottoms at an angle of 45° , that is, the vertical rise should be equal to the horizontal run. (See diagram)

Ground feed bins: Should be high and narrow rather than broad and low. The floor should have a slope of at least 60° , that is, the vertical rise should be $1\frac{2}{3}$ feet for each foot of horizontal run. (See diagrams). A simple agitator may be required for ground oats even with this steep slope.

Chutes: Grain chutes should be at least 6" inside, either square or round, and slope at an angle of at least 45° .

Ground feed chutes must be at least 1 ft. inside, either square or round. These chutes should be vertical or nearly so.

Mill foundation: The mill should be fastened to a reasonably solid foundation. It is not apt to vibrate appreciably but should not be placed on a flimsy framework.

Power Transmission

Drives: (a) Belted direct from the motor to the mill is usually recommended. Do not drive through a line shaft.

(b) Direct connected to a 3500 R.P.M. motor where the motor is used for grinding only.

Belt: Four inches wide, split ribbed, and preferably equipped for a 5 HP motor. 3 ply endless rubber or 1 1/2 inch split ribbed leather, either endless or joined with wire lacing. Avoid thick split belts and split contact with pulleys. A distance of 6 to 12 feet between pulleys is good.

Pulleys: The pulleys are usually equipped with 1 1/2 inch or cast iron pulleys. 1 1/2 inch diameter with a 1/2 inch or 3/4 inch. High speed is essential for efficient operation of a hammer mill.

Two types of rotating cylinders are used. In one type the cylinder is straight, the hammers are all the same length and the diameter is about one foot. The recommended speed is 4000 R.P.M. requiring a 7 HP motor on an 1800 R.P.M. motor, or a 14 HP motor on a 1200 R.P.M. motor.

In the other type, the cylinder is smaller on one end than the other and the grain is fed in at the small end. A speed of 3500 R.P.M. is recommended requiring an 8 HP motor on an 1800 R.P.M. motor or a 12 HP motor on a 1200 R.P.M. motor.

Installation

General Principles: The mill should be installed with an overhead bin so that it can be operated without an attendant. The ground level can be dropped directly into an enclosed stand feed bin, or elevated to a convenient bin, or to the height of the bin elevator.

Hopper Bottoms for Grain: Hopper bottoms are not necessary for ordinary elevated grain elevators and are omitted in place of a 1/2 inch screen.

Grain Elevator: The mill should have a sloping bottom of 1/2 inch at 45 degrees, that is, the vertical rise should be equal to the horizontal run. (See diagram)

Grain Feed Bin: Should be high and narrow rather than broad and low. The floor should have a slope of at least 1/2 inch. The vertical rise should be 1/2 inch for each foot of horizontal run. (See diagram). A single 1/2 inch floor may be required for ground runs with this steep slope.

Grain Elevator: Should be at least 1/2 inch, either square or round, and slope at an angle of at least 45 degrees.

Grain Feed Bin: Should be at least 1/2 inch, either square or round, and slope at an angle of at least 45 degrees.

Mill Foundation: The mill should be founded on a reasonably level foundation. It is not recommended that the mill be founded on a highway or a railway.

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Blower Pipe: If it is desired to blow the feed horizontally more than about 8 or 10 feet, the pipe should be arranged to go straight up somewhat higher than the ground feed bin or dust collector, then slope downward to the bin at an angle of 30° with the horizontal. (See diagram)

Elevating Grain

The fan of the mill can be used very satisfactorily for elevating grain at threshing time. The fans have a capacity of 200 or more bushels per hour, depending upon the size of the fan and the elevation.

Method of Elevating Grain: Feed the grain into the fan directly.

Speed of Fan for Elevating Grain: Run at a slower speed than when grinding to avoid cracking and hulling. Recommended speed - 1200 to 1600 R.P.M. for elevations up to 15 or 20 feet. For higher elevations, slightly higher speeds will probably be required. However, speeds much in excess of 1600 R.P.M. will be apt to hull or crack some of the grain. Exceedingly high speeds causing excessive cracking of the grain might cause the grain to mold.

Rate of Grinding and Energy Cost

The rate of grinding varies with:

- (a) The fineness of grinding.
- (b) The size of the motor.
- (c) The material being ground.
- (d) The condition of the grain, whether damp or dry.

In general,

One kilowatt hour of energy will grind from 35 to 300 pounds of material.

A 5 HP motor will grind from 200 to 1500 pounds per hour.

It requires 7 to 60 kilowatt hours to grind one ton.

Ordinary cow feed will require from 7 to 15 kilowatt hours per ton.

The cost will ordinarily vary from 25¢ to \$1.50 per ton.

Where considerable current is used and energy for grinding is purchased at around 3¢ per kilowatt hour, ordinary cow feed will cost from 25¢ to 50¢ per ton for grinding.

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The Annual Overhead Cost of Owning a Mill

Assume first cost -	\$90.00	
Assume total life -	16 years	
Depreciation - 1/16 of \$90.00	-	\$5.62
Interest (<u>\$90.00 plus \$5.62</u>) @ 6%	-	2.87
	2	
Repairs	-----	<u>1.00</u>
		\$9.49

In general, the mill is not recommended for herds of less than 12 to 15 cows.

The Annual Overhead Cost of Owning a 5 HP Utility Motor

Assume first cost plus freight -	\$215.00	
Assume total life -	25 years	
Depreciation - 1/25 of \$215.00	-----	\$8.60
Interest (<u>\$215.00 plus \$8.60</u>) @ 6%	---	6.70
	2	
Repairs	-----	<u>3.00</u>
		\$18.30

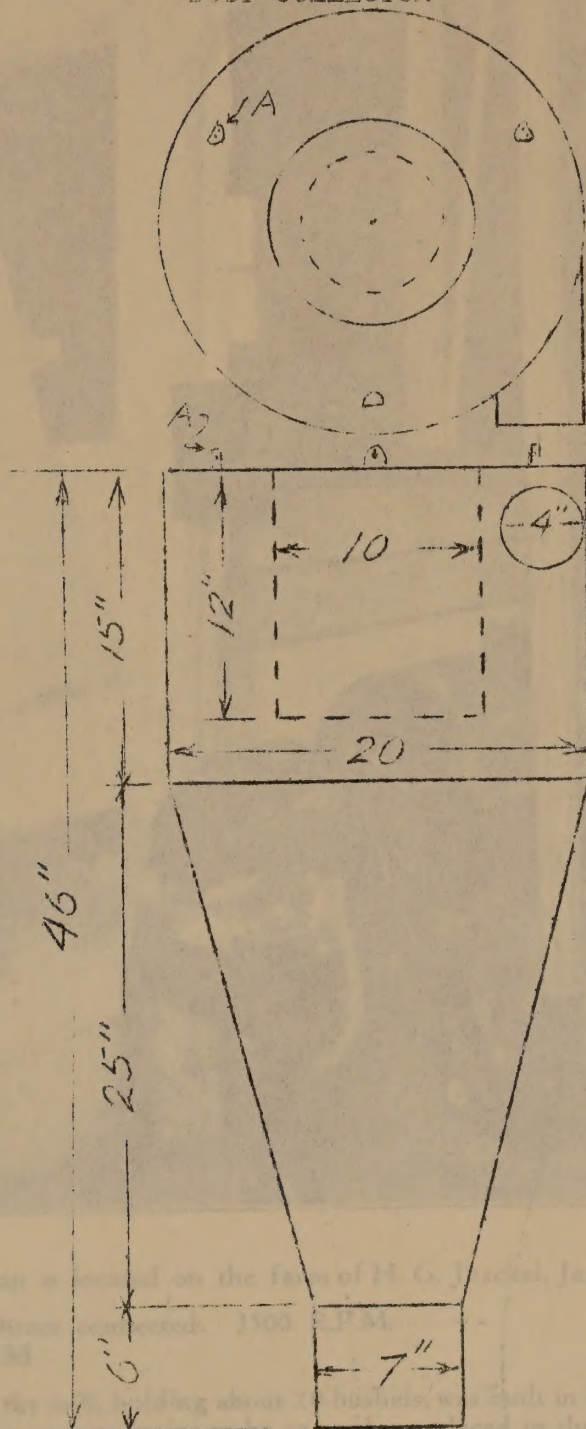
If the motor is used for several different jobs, this cost of \$18.30 should be divided among the various jobs. That is, if the motor was used for grinding feed, cutting ensilage, hoisting hay and elevating grain, the motor overhead cost would average \$4.56 for each job.

[illegible][illegible]

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GRINDING FEED

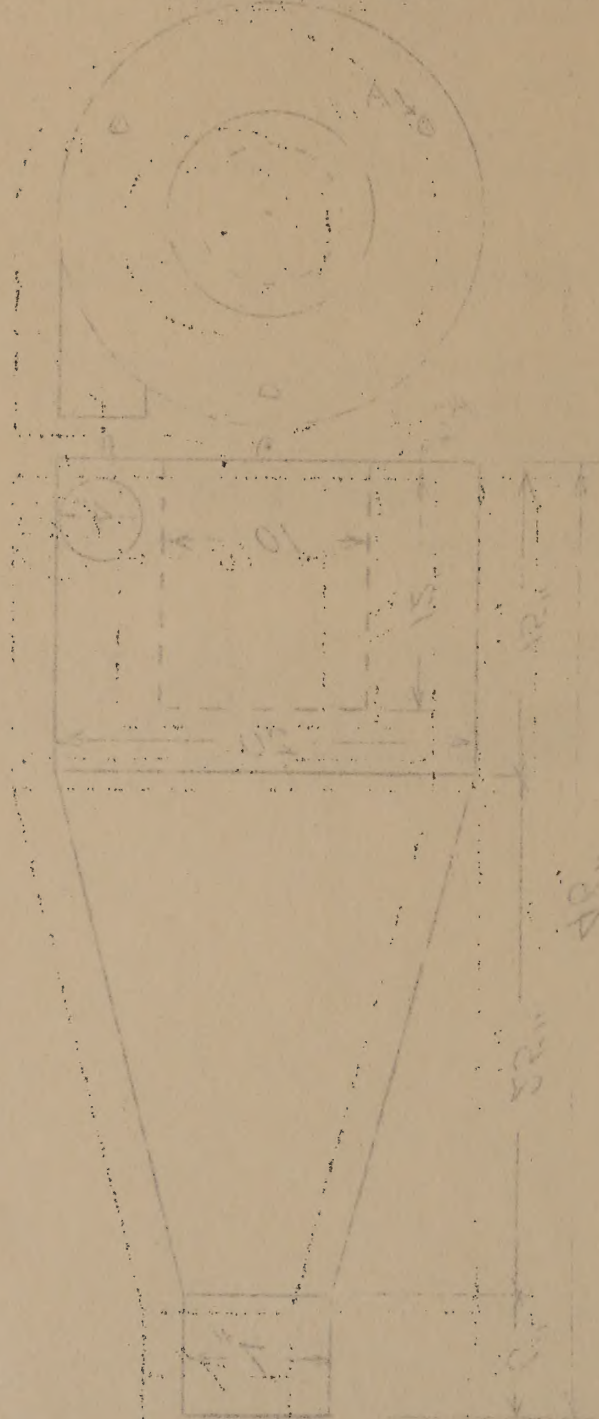
DUST COLLECTOR



The specifications of the dust collector are of a typical installation on the farm of Wm. Noyes, Beaver Dam, Wis., and used with a hammer type feed grinder. It was made by a local tinsmith out of 26 gauge galvanized iron. Pail bails (A) are used to hang the dust collector from the ceiling or beams.

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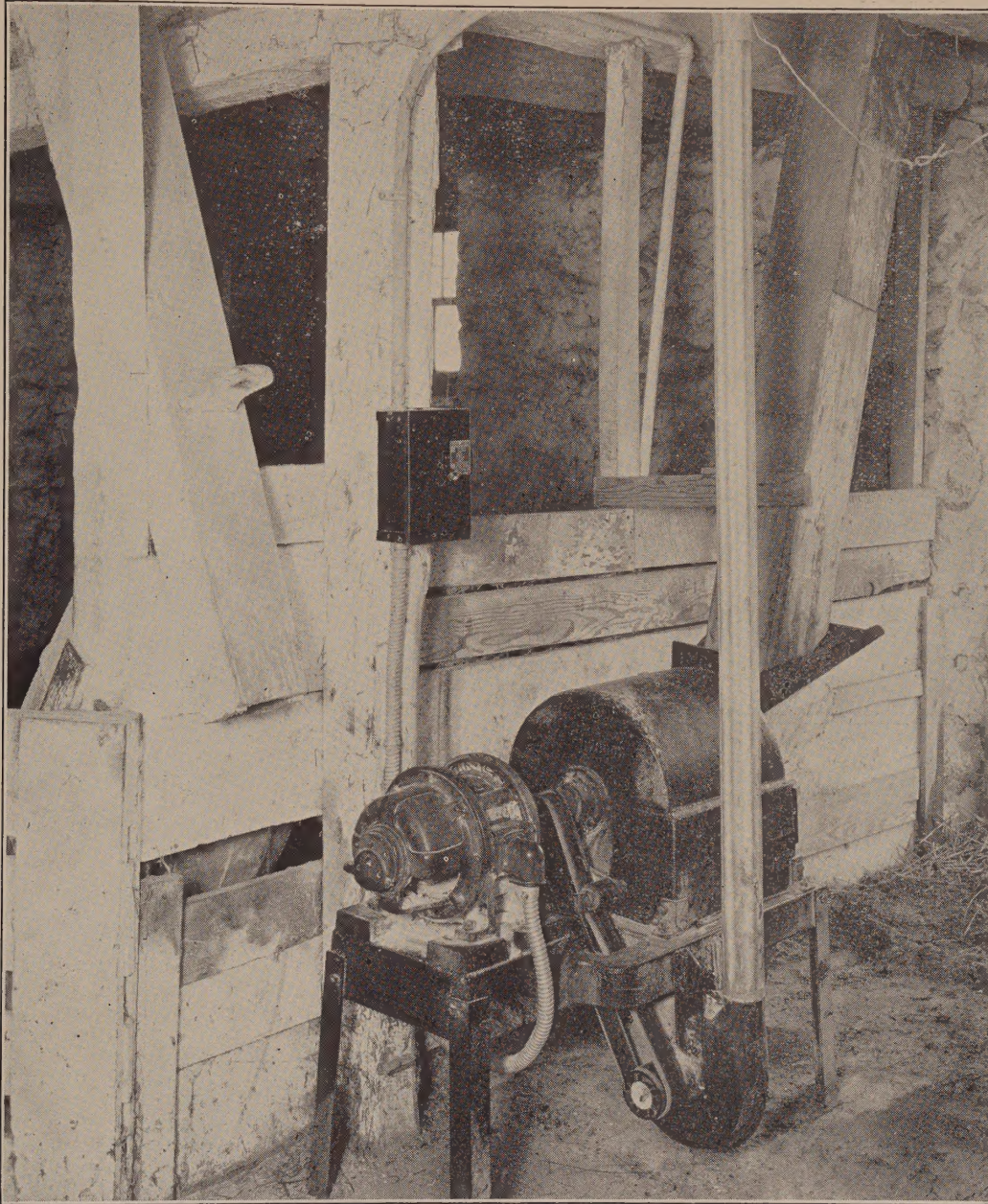
W. J. UNDER
INSECT COLLECTOR



The description of the insect collector and of a typical installation of the same is given in the report of the author, W. J. Under, "The Insect Collector", published in the "Journal of the Entomological Society of America", Vol. 1, No. 1, 1910. It was one of a local installation of 25 collectors, with a total of 1000 bottles (A) and used to keep the insect collector from the collector of insects.

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Hammer Type Feed Mill Installation



The above installation is located on the farm of H. G. Joeckel, Jackson, Wis.

Mill: Hammer type. Direct connected. 3500 R.P.M.

Motor: 2 HP. 3500 R.P.M.

A supply hopper for the mill, holding about 20 bushels, was built in the alleyway of the granary. Alternate shovelfuls of the various grains to be ground are placed in the bin. A chute delivers the grain to the mill and thorough mixing takes place in the process of grinding. The attached blower delivers the ground and thoroughly mixed feed to a bin located at the end of the feed alley where it is handy for feeding the cattle.

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(See other side)

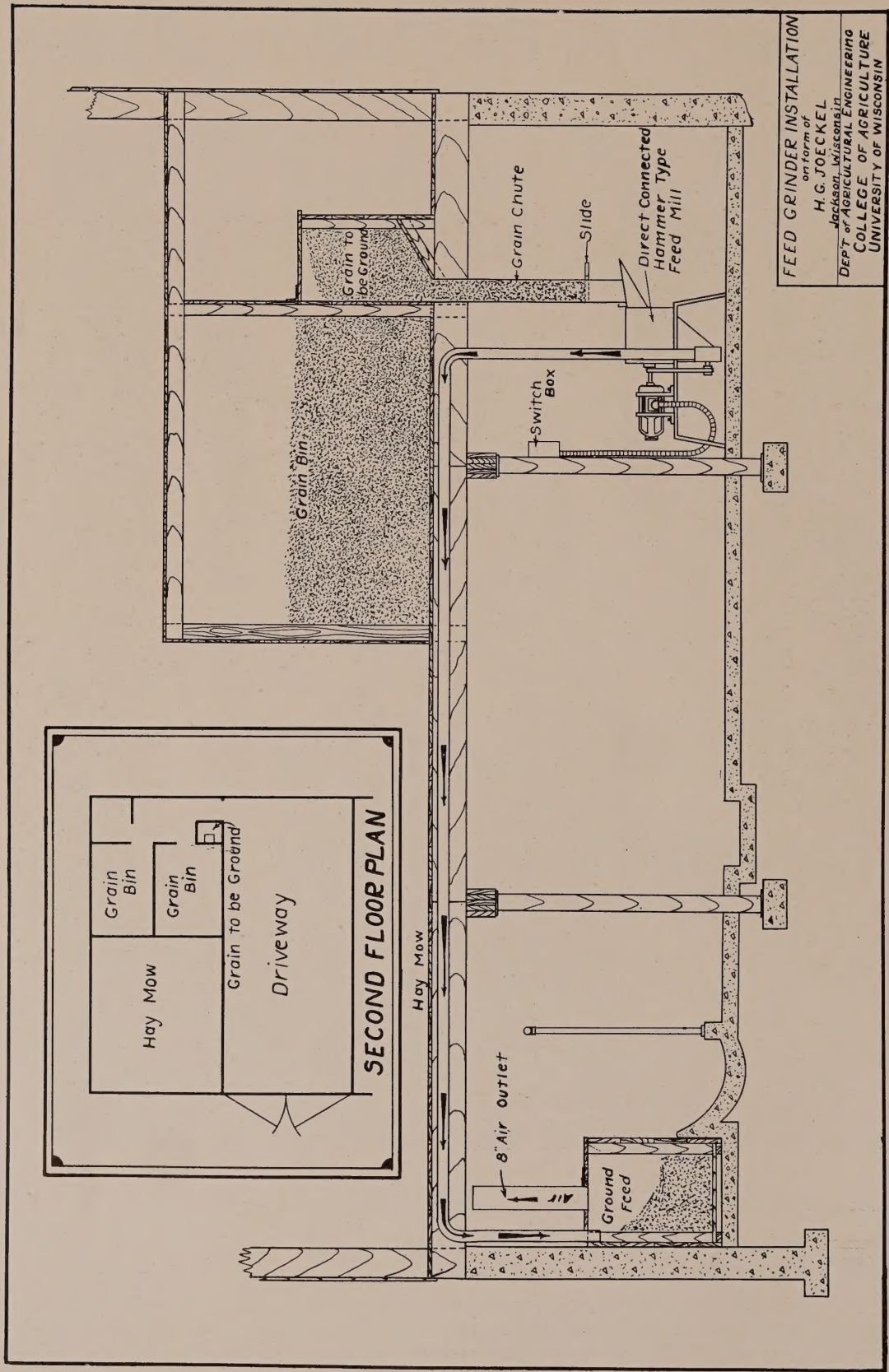
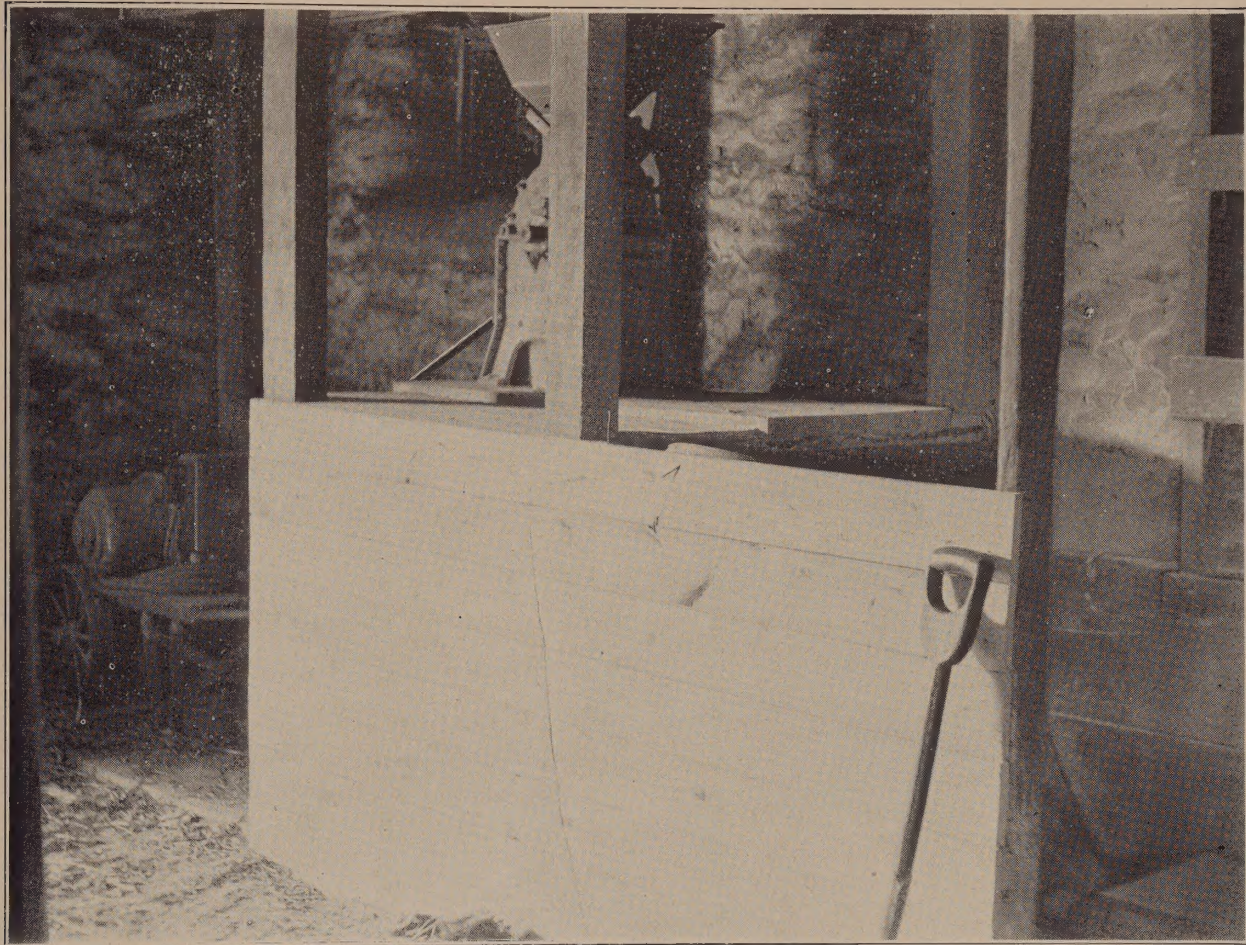


Diagram of Bin Arrangement
(See Other Side)

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Hammer Type Feed Mill Installation



The above installation is located on the farm of Alvin Wilkes, Ripon, Wis.

Mill: Hammer type. 3500 to 4000 R.P.M. 4" pulley.

Motor: 5 HP portable utility motor. 1750 R.P.M. 8" or 9" pulley.

Belt: 3 ply endless rubber belt. 4" wide. 10 feet between pulleys.

The grain is stored in two large overhead bins. Chutes deliver the grain from these to the hammer feed mill where it is ground. The mill is placed on top of the ground feed bin so that the ground feed falls directly into it. A burlap curtain is hung on the open side to help keep down the dust. A small mixing floor is provided in front of the bin.

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(See other side)

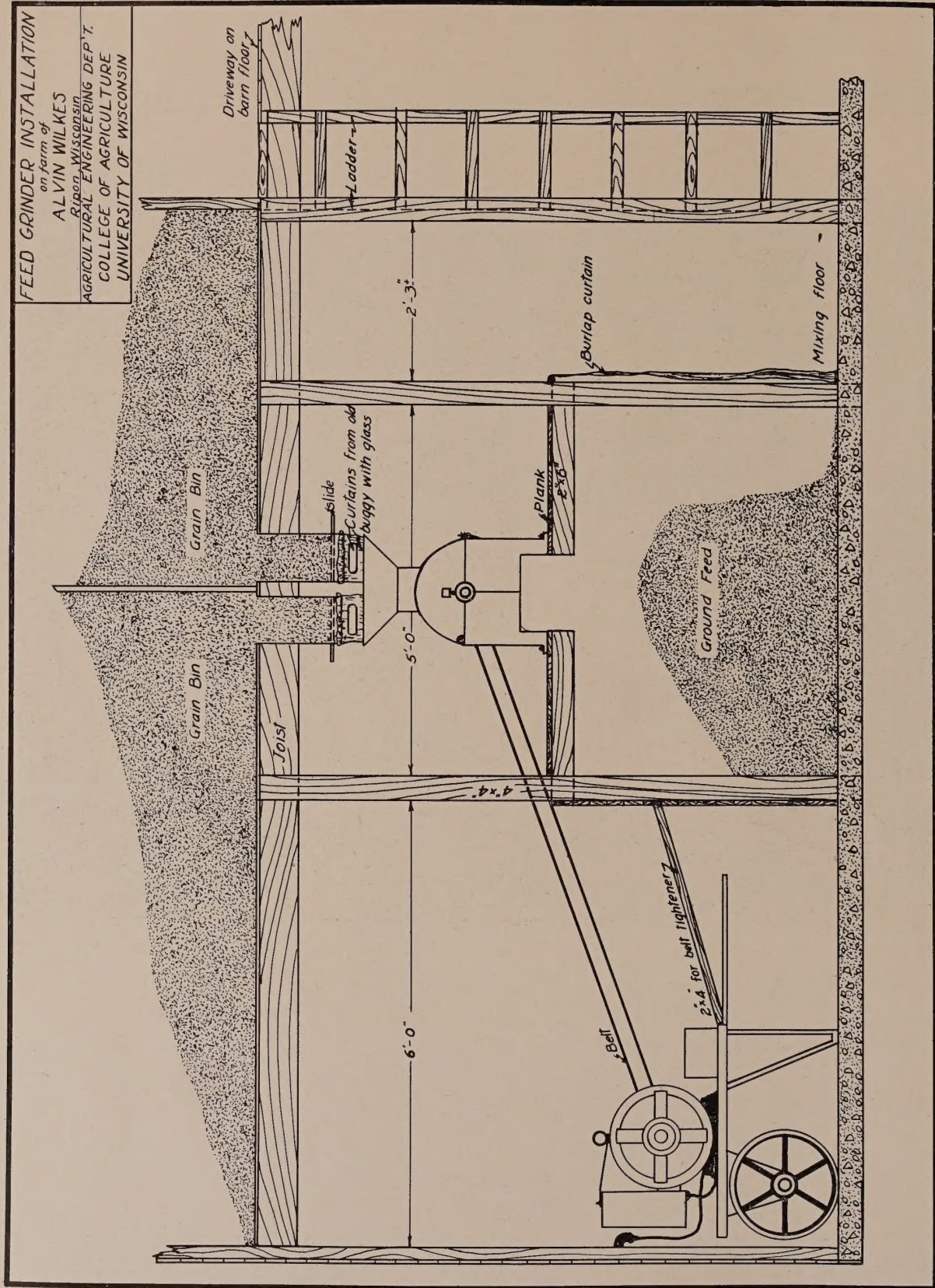
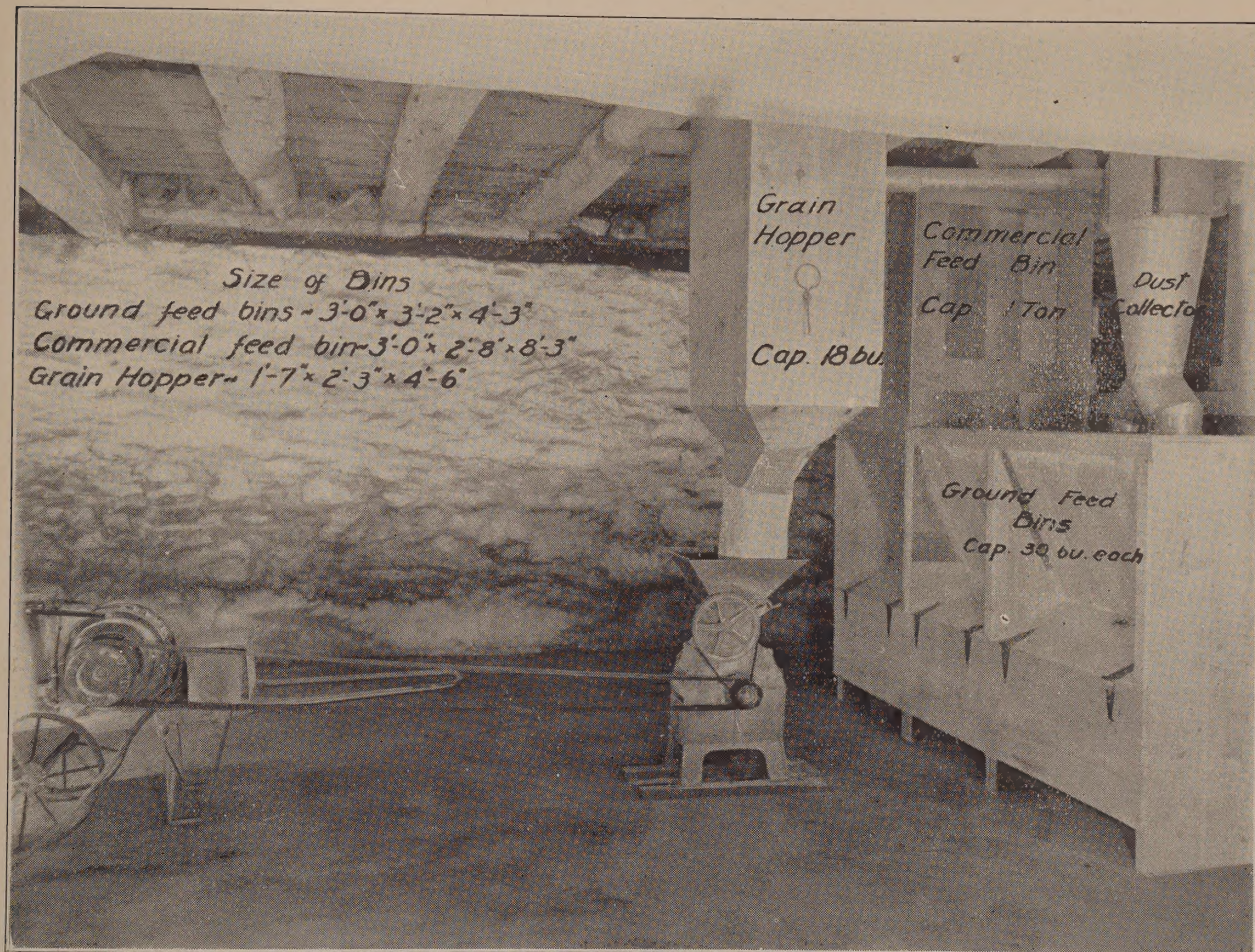


Diagram of Bin Arrangement
 (See Other Side)

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Hammer Type Feed Mill Installation



The above installation is located on the farm of Carl Block, Wausau, Wisconsin.

Mill: Hammer type. 3500 to 4000 R.P.M. 4" pulley.

Motor: 5 HP portable utility motor. 1750 R.P.M. 8" or 9" pulley.

Belt: 3 ply endless rubber belt. 4" wide. 10 ft. between pulleys.

The grain hopper and commercial feed bin have trap doors which open onto the threshing floor. The granary is located in one of the haymows so that the grain can be taken from this to the grain hopper either in sacks or a wheelbarrow. With two ground feed bins it enables him to keep the ground corn and oats separate. The commercial feed bin has a capacity of one ton and is used for bran, middlings, linseed meal, etc.

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(See other side)



Hammer type feed mill installation

(See other side)

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Hammer Type Feed Mill Installation



The above installation is located on one of the University of Wisconsin farms, Madison, Wisconsin.

Mill: Hammer type. 3500 to 4000 R.P.M. 4" pulley.

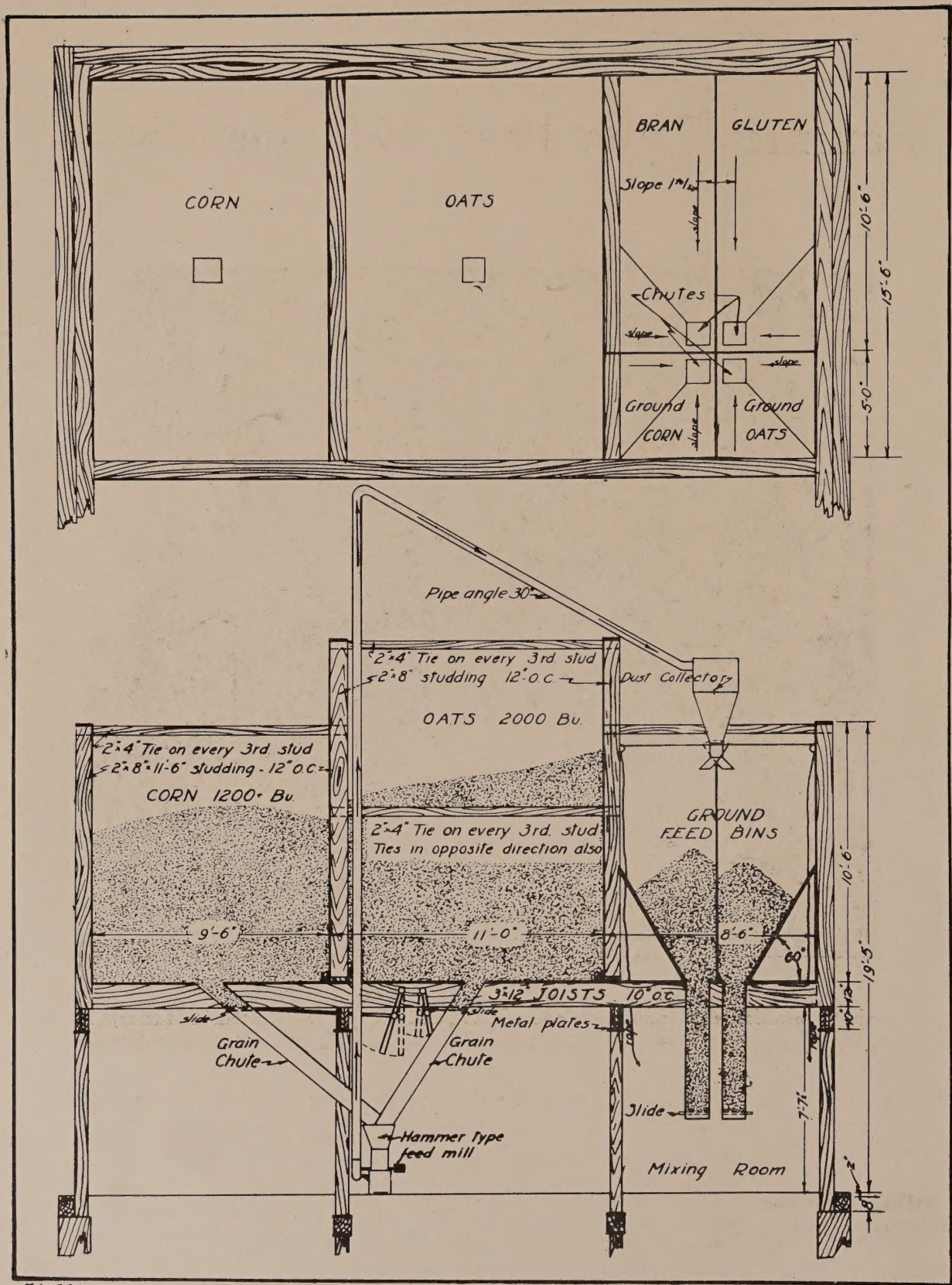
Motor: 5 HP portable utility motor. 1750 R.P.M. 8" or 9" pulley.

Belt: 3 ply endless rubber belt. 4" wide. 10 ft. between pulleys.

Large overhead bins are used to store the grain. Chutes deliver the grain from these to the hammer feed mill where it is ground. The blower delivers the ground feed to overhead bins from which it is taken as needed for mixing the ration.

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Diagram of Bin Arrangement

(See other side)

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Agricultural Engineering Department

Hammer Type Feed Mill Installation



The above installation is located on the farm of H. S. Stauffacher, Monroe, Wisconsin

MILL: Hammer Type. 3500 R. P. M. 4" pulley.

MOTOR: 5 H. P. portable utility motor. 1750 R. P. M. 8" pulley.

BELT: 3 ply endless rubber belt, 4" wide, 10 Ft. between pulley centers.

Mr. Stauffacher mixes the grain in the small bin supplying the mill by alternately shovelling in small quantities of the various grains desired in the ration. By this method the grain is thoroughly mixed by the time it goes through the mill. This arrangement is extremely handy and saves hours of time.

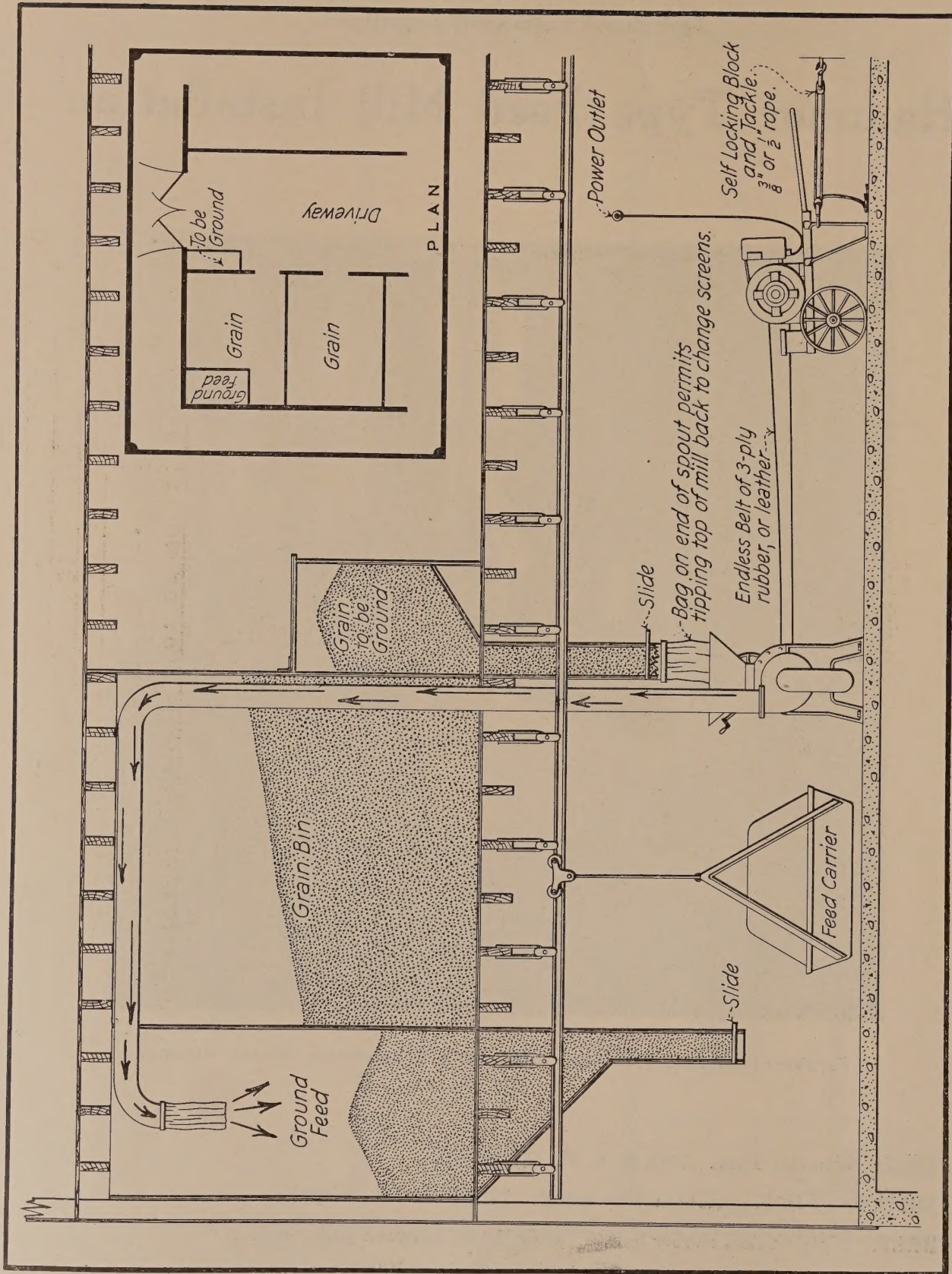


Diagram of Bin Arrangement

(See Other Side)

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DAIRY REFRIGERATION TESTS

1927

These records were taken on four farms furnished central station service by the Southern Wisconsin Electric Company, Lake Geneva, Wisconsin.

Farm No.	Months used inclusive	No. of months used	Pounds milk cooled	Ave. milk cooled per mo.	Type of installation	KILOWATT HOUR CONSUMPTION					
						Total used	Ave. per mo.	Ave. per 100#	High mo. used	Low mo. used	No.
1	Apr. to Nov.	8	143,752	17,969	Wet	1303	163	.906	June: 205	Nov.: 92	
2	Apr. to Nov.	8	145,964	18,245	Wet	1430	179	.979	July: 232	Nov.: 78	
3	July to Oct.	4	95,559	23,890	Wet	955	239	.999	Aug.: 286	Oct.: 190	
4*	July to Oct.	4	83,222	20,805	Wet	787	197	.946	Aug.: 231	Oct.: 166	
Totals and Averages:		24	468,497	19,520		4475	186	.955			

*This is a two compartment tank. Due to the smaller compartment, the water for the evening's milk is left at a higher level which is more favorable for cooling the milk.

DATA ON BACTERIA COUNT

Table giving the data on the bacteria content of the refrigeration units of the table above. A premium of 40 cents per hundred pounds of fluid milk is paid if the bacteria content is below 10,000 and 25 cents if between 10,000 and 25,000.

Farm No.	Ave. bacteria count per week	No. of weeks below 10,000	No. of weeks between 10,000 to 25,000	No. of weeks over 25,000
1	38,140	10	9	13
2	3,537	31	1	0
3	10,515	8	8	0
4	12,435	9	5	2

DAIRY REFRIGERATION TESTS

1928

These records were taken on six farms furnished central station service by the Southern Wisconsin Electric Company, Lake Geneva, Wis.

Farm No.	Months used inclusive	No. of months used	Pounds milk cooled	Ave. milk cooled per mo.	Type of installation	KILOWATT HOUR CONSUMPTION					
						Total used	Ave. per mo.	High used	Low used	No. used	No. Used
1	Apr. to Nov.	8	128,641	16,005	Wet	1121	140	.875	Aug.	210	Nov.
2	Apr. to Nov.	8	144,604	18,075	Wet	1449	181	1.002	Aug.	265	Nov.
3	Apr. to Nov.	8	255,214	31,902	Wet	1742	218	.682	Aug.	347	Nov.
4	Jan. to Nov.	11	184,344	16,758	Wet	1570	143	.851	July	250	Feb.
5	May 16 - Nov.	5.5	148,859	27,065	Dry	1741	317	1.169	Aug.	442	Oct.
6	Aug. to Oct.	3	79,425	26,475	Wet	981	327	1.235	Aug.	435	Oct.
Totals and averages		43.5	940,487	21,620		8604	221	.915			

NOTE: The records of farms No. 1 to 4 inclusive are from the same farms as those given under these numbers for 1927.
An aerator is used on Farm No. 5. The energy used for pumping the water is not metered nor included in the record.

DATA ON BACTERIA COUNT

Table giving the data on the bacteria content of the refrigeration units of the table above.
A premium of 40 cents per hundred pounds of fluid milk is paid if the bacteria content is below 10,000 and 25 cents if between 10,000 and 25,000.

Farm No.	Ave. bacteria count per week	No. of weeks below 10,000	No. of weeks 10,000 to 25,000	No. of weeks over 25,000
1	48,844	8	12	12
2	8,847	21	9	2
3	12,278	16	13	3
4	13,643	30	10	4
5	13,886	11	8	3
6	11,211	8	3	1

DAIRY REFRIGERATION
Specifications of Installations

These units are located on six farms furnished central station service by the Southern Wisconsin Electric Company, Lake Geneva, Wisconsin. The numbers of these farms correspond with the dairy refrigeration tests for 1927 and 1928.

Specifications	Farm Number					
	1	2	3	4	5	6
Make and model of system	Servel 51	Servel 51	Servel 51	Servel 51	Kelvinator	Kelvinator
Type of installation	Wet	Wet	Wet	Wet	Dry	Wet
Size of tank						
Length	7'6"	6'4"	10'0"	12'9"	5'0"	9'4"
Width	4'8"	3'4"	5'8"	3'9"	3'9"	3'9"
Depth	1'10"	1'10"	2'0"	1'10"	5'10"*	2'0"
Capacity in cans	15	12	20	20	12	16
Kind of insulation	Cork	Cork	Cork	Cork	Cork	Celotex
Thickness of insulation						
Sides	3"	2"	None	3"	3"	1.5"
Bottom	3"	1"	None	3"	None	1.5"
Ceiling or cover					3"	1.5"**
Thickness of wall	8"	10"	7"	10"	6"	8"
Motor Size - HP	1.5	1.5	1.5	1.5	1.5	1.5
Method of cooling compressor	Water	Water	Water	Water	Air	Air
Method of control	Auto-matic	Auto-matic	Manual	Auto-matic	Auto-matic	Auto-matic

NOTES: Farm No. 4 has a twin tank. The sizes of these are 6'9" x 3'9" x 1'10" and 6'0" x 3'9" x 1'10". These are separated by a 4" concrete wall.

On Farm No. 5 an aerator is used to aid in the cooling of the milk. Cold water is available and used to reduce the load on the compressor. The energy for pumping the water is not metered.

*The brine tank occupies the upper part of this dry box, leaving a height of 40" for the milk cans. The door of this unit is about 36" high.

On Farm No. 6, two 6" x 8" annular tubes are used to cool the tank. **Two one-half" boards are also used.

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WATER REQUIREMENTS

Capacity: 200 to 400 gallons per hour with most farm conditions.
Pressure tank: 40 gallons and larger. A 100 gallon tank is usually used to 125 pounds is recommended. Automatic switch is usually adjusted to start the motor at 20 pounds and stop it at 40 pounds.
Pump tank: Substantial, good sized bearings, frame covered and preferably mounted in oil. Connected directly to motor, which eliminates belt, is preferred.
Motor: Connected to one horsepower depending upon total lift, pressure and volume pumped. See table.
Cylinder: Diameter 2 to 3 inches with a 2 inch stroke is usually used.
Pistons: One inch valves are usually satisfactory. 3/4" may be used if not much water is needed at one time. If the distance from the pump to the pressure tank is not over 10 feet and the capacity desired not over 200 gallons per hour, a one inch pipe is satisfactory. For greater distances and larger capacities a 1 1/2" pipe is desirable.

Water requirements per unit per day:

Person (bath room)	35 gallons
Person (no bath room)	10 "
Cow	10 "
Horse	10 "
Hog	5 "
Sheep	5 "

The above figures are averages and as a variation in the amount of water consumed may be expected. Large cows and heavy milkers, for example, will require more water than small or dry cows.

CAPACITY OF PRESSURE TANKS

Size in inches	Capacity in gallons
12 x 40	42
12 x 48	50
12 x 60	60
12 x 72	72
12 x 84	84
12 x 96	96
12 x 108	108
12 x 120	120
12 x 132	132
12 x 144	144
12 x 156	156

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TABLE OF PUMPING CAPACITIES

(Courtesy of the John Lauson Mfg. Co.)

This applies to pumping into open tanks only.

Length of:Gallons: Maximum height in feet to which water can be pumped without
stroke in:Pumped : overloading motor
inches :per min: Using $\frac{1}{4}$ HP : Using $\frac{1}{3}$ HP: Using $\frac{1}{2}$ HP : Using $\frac{3}{4}$ HP: Using 1 HP

Cylinder $1\frac{1}{2}$ " in diameter

6	:	1.84	:	188	:	275	:	550	:	907	:	1210
7	:	2.16	:	160	:	230	:	460	:	758	:	1014
8	:	2.44	:	140	:	205	:	410	:	676	:	902

Cylinder 2" in diameter

6	:	3.28	:	105	:	150	:	300	:	495	:	660
7	:	3.80	:	90	:	130	:	260	:	428	:	572
8	:	4.36	:	78	:	116	:	232	:	383	:	511

Cylinder $2\frac{1}{4}$ " in diameter

6	:	4.12	:	82	:	120	:	240	:	396	:	527
7	:	4.84	:	71	:	102	:	205	:	338	:	451
8	:	5.52	:	62	:	90	:	180	:	298	:	395

Cylinder $2\frac{1}{2}$ " in diameter

6	:	5.12	:	67	:	96	:	192	:	328	:	425
7	:	5.96	:	57	:	81	:	162	:	267	:	353
8	:	6.80	:	51	:	74	:	148	:	244	:	325

Cylinder $2\frac{3}{4}$ " in diameter

6	:	6.16	:	55	:	78	:	159	:	262	:	350
7	:	7.20	:	47	:	68	:	136	:	224	:	298
8	:	8.24	:	41	:	60	:	120	:	198	:	264

Cylinder 3" in diameter

6	:	7.36	:	47	:	67	:	135	:	223	:	297
7	:	8.56	:	40	:	57	:	115	:	189	:	251
8	:	9.80	:	35	:	51	:	102	:	168	:	220

Cylinder $3\frac{1}{2}$ " in diameter

6	:	10.00	:	33	:	49	:	98	:	163	:	212
7	:	11.68	:	30	:	42	:	84	:	138	:	185
8	:	13.32	:	26	:	38	:	75	:	124	:	165

Cylinder 4" in diameter

6	:	13.04	:	26	:	38	:	76	:	121	:	167
7	:	15.24	:	23	:	37	:	65	:	107	:	143
8	:	17.40	:	19	:	28	:	57	:	94	:	126

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TABLE OF PUMPING CAPACITIES

(Courtesy of the John Deere Mfg. Co.)

This applies to pumping into open tanks only.

Length of Cylinders: Maximum height in feet to which water can be pumped without stroke in: Pumped: overloading motor						
Inches: per min: Using 1/2 HP: Using 1/3 HP: Using 3/4 HP: Using 1 HP						
Cylinder 1 1/2" in diameter						
8	: 1.64 :	188	: 375 :	380	: 907 :	1210
7	: 2.18 :	160	: 330 :	480	: 758 :	1014
6	: 2.44 :	140	: 305 :	410	: 676 :	902
Cylinder 2" in diameter						
8	: 3.28 :	105	: 150 :	300	: 495 :	650
7	: 3.80 :	90	: 130 :	280	: 438 :	572
6	: 4.36 :	78	: 118 :	238	: 383 :	511
Cylinder 2 1/2" in diameter						
8	: 4.12 :	82	: 120 :	240	: 398 :	527
7	: 4.84 :	71	: 102 :	208	: 339 :	461
6	: 5.32 :	62	: 90 :	180	: 293 :	395
Cylinder 3" in diameter						
8	: 5.12 :	67	: 98 :	192	: 320 :	422
7	: 5.98 :	57	: 81 :	162	: 267 :	358
6	: 6.30 :	51	: 74 :	148	: 244 :	325
Cylinder 3 1/2" in diameter						
8	: 6.16 :	55	: 78 :	156	: 262 :	350
7	: 7.20 :	47	: 68 :	132	: 224 :	302
6	: 8.24 :	41	: 60 :	120	: 199 :	264
Cylinder 4" in diameter						
8	: 7.36 :	47	: 67 :	132	: 223 :	297
7	: 8.58 :	40	: 57 :	112	: 189 :	251
6	: 9.36 :	35	: 51 :	102	: 168 :	220
Cylinder 4 1/2" in diameter						
8	: 10.00 :	38	: 49 :	98	: 163 :	212
7	: 11.68 :	30	: 42 :	84	: 138 :	185
6	: 12.36 :	26	: 38 :	75	: 124 :	162
Cylinder 5" in diameter						
8	: 12.04 :	32	: 53 :	76	: 171 :	187
7	: 13.84 :	23	: 37 :	62	: 107 :	143
6	: 17.10 :	19	: 28 :	57	: 94 :	122